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Pesticide Fact Sheet Number 110
Arsenic Trioxide

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EPA, Office of Pesticide Programs, Registration Division

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US Environmental Protection Agency
Office of Pesticide Programs
Registration Division, TS-767C
401 M Street, S.W.
Washington, D.C. 20460

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This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the following actions has occurred.

1. Issuance or reissuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

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Pesticide Fact Sheet

Name of Chemical: Arsenic trioxide
Reason for Issuance: Special review
Date Issued: December 1986
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1. DESCRIPTION OF CHEMICAL

Common Name: Arsenic Trioxide

Chemical Name: Arsenious oxide - As_2O_3

Trade Names: Refined arsenic trioxide is known as white arsenic

EPA Shaughnessy Code: 007001

Chemical Abstracts Service (CAS) Number: 1327-53-3

Year of Initial Registration:

Pesticide Type: Antifoulant agent, Herbicide, Insecticide and Rodenticide.

Chemical Family: Inorganic Arsenicals

U.S. and Foreign Producers: Grant Laboratories

2. USE PATTERNS AND FORMULATIONS

Approximately 85% of the pesticidal use of arsenic trioxide is as a liquid rodenticide bait to control rats and mice. The remaining 15% is used to kill moles and pocket gophers, as an insecticide bait to control ants and as an antifoulant agent in boat paints. Arsenic trioxide is currently registered as a noncrop herbicide; however, there is no known usage at this time.

- Methods of Application: Rodenticide baits are applied where rats, mice, moles and gophers are seen. As an insecticide it is used in bait stations and as an antifoulant it is applied by painting.

- Application Rates: Rodenticide- These baits contain 1.14% arsenic.
  Antifoulant- 2.4% arsenic/gallon batch

Types of Formulations: Pellets, wettable powders, pastes, ready to use solutions, impregnated material, granular and as a formulation intermediate.

3. SCIENCE FINDINGS

- Chemical Characteristics

  Arsenic trioxide is a form of inorganic arsenic. It normally exists either as transparent crystals or an amorphous white powder with no discernible odor. Arsenic trioxide contains 76% arsenic and is slightly soluble in water and other solvents which do not promote chemical transformation. However, the compound dissolves in acidic or alkaline aqueous media to yield either a free acid or salt which are soluble in a number of solvents. As_2O_3 sublimes at 193°C, the density is 3.865 and the molecular weight is 197.84. The technical chemical contains between 90% and 99.5% and the formulations contain from 0.25% to 25.0% arsenic trioxide. Arsenic trioxide is produced as a by-product of copper smelting operations. It is the base compound from which all other arsenicals are produced.

- Toxicological Characteristics

  Inorganic arsenical compounds have been classified as Class A oncogens, demonstrating positive oncogenic effects based on sufficient human epidemiological evidence.

  Inorganic arsenicals have been assayed for mutagenic activity in a variety of test systems ranging from bacterial cells to peripheral lymphocytes from humans exposed to arsenic. The weight of evidence indicates that inorganic arsenical compounds are mutagenic.

  Evidence exists indicating that there is teratogenic and fetotoxic potential based on intravenous and intraperitoneal routes of exposure; however, evidence by the oral route is insufficient to confirm arsenic trioxide's teratogenic and fetotoxic effects.

  Inorganic arsenicals are known to be acutely toxic. The symptoms which follow oral exposure include severe gastrointestinal damage resulting in vomiting and diarrhea, and general vascular collapse leading to shock, coma and death. Muscular cramps, facial edema, and cardiovascular reactions are also known to occur following oral exposure to arsenic.

- Environmental Characteristics: The environmental fate of arsenic trioxide is not well documented. Studies to demonstrate its fate must take into account the fact that inorganic arsenicals are natural constituents of the soil, and that forms of inorganic arsenic may change depending on environmental conditions.

- Ecological Characteristics: Arsenic trioxide is moderately toxic to birds, slightly toxic to fish and moderately toxic to aquatic invertebrate species.

- Metabolism: The metabolism of inorganic arsenic compounds in animals is well known. The pentavalent form is metabolized by reduction into the trivalent form, followed by transformation into organic forms which are excreted within several days via the urine. All animals exhibit this metabolism except rats, which retain arsenic in their bodies for up to 90 days.

- Reported Pesticide Incidents: The Agency's Pesticide Incident Monitoring System (PIMS) contains many recorded incidents of accidental poisonings from the use of arsenic trioxide baits. Between 1966 and 1979, 72 incidents were reported; ten of these incidents resulted in child fatalities.

4. SUMMARY OF REGULATORY POSITION AND RATIONALE

The Agency is proposing to cancel all existing nonwood registrations of arsenic trioxide. Based upon the risk of acute toxicity poisonings and the other toxicological characteristics described above, the Agency has determined that in light of the limited benefits for nonwood uses of arsenic trioxide the risks of continued use outweigh the benefits.

- Benefits Analysis: Nationwide, user costs would be expected to increase by approximately five thousand dollars if arsenic trioxide were cancelled for moles and pocket gophers, resulting in no measurable impact. For all other uses negligible impact is expected.

5. CONTACT PERSON

Douglas McKinney
Special Review Branch, Registration Division
Office of Pesticide Programs (TS-767C)
401 M Street, S.W.
Washington, D.C. 20460
(703) 557-5488

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